

Two New Species of *Croomia* (*Stemonaceae*) from Miyazaki Prefecture, Kyushu, Southern Japan

Yuichi KADOTA^{a,*} and Masami SAITO^b

^a Department of Botany, National Museum of Nature and Science,
4–1–1, Amakubo, Tsukuba, 305-0005 JAPAN;

^b Miyazaki Prefectural Museum of Nature and History,
2–4–4, Jingū, Miyazaki, 880-0053 JAPAN

*Corresponding author: kadota@kahaku.go.jp

(Received on May 8, 2010)

Two new species of *Croomia* (*Stemonaceae*), *C. saitoana* Kadota and *C. hyugaensis* Kadota & Mas. Saito, are here described from Miyazaki Pref., Kyushu, southern Japan. *Croomia saitoana* differs from *C. japonica* Miq. [= *C. kiusiana* Makino] in having small, solitary, dark purplish brown flowers, thicker and shorter staminal filaments, thicker purplish stem, the absence of bracts and (6–)7–11 caudine leaves with 3–5 veins. *Croomia hyugaensis* is distinguished from *C. japonica* by having solitary flower, entire leaf margin, 4–6, slightly fleshy, cordate caudine leaves with cordate base; from *C. saitoana* by larger flowers, longer staminal filaments, slender green stem, prominent, linear to spathulate bracts and 4–6, slightly fleshy, cordate caudine leaves with 5–7 veins and entire margins. *Croomia hyugaensis* and *C. saitoana* are known exclusively from Miyazaki Pref., Kyushu, and are the forth and the fifth species in the genus *Croomia*, respectively. A key to the species of the genus *Croomia* is also provided.

Key words: *Croomia hyugaensis*, *Croomia saitoana*, Kyushu, Miyazaki prefecture, new species.

The genus *Croomia* Torr. [in Torr. & A. Gray, Fl. N. Amer. 1: 663 (1840)] (*Stemonaceae*) is composed of three species and shows of the East Asian and eastern North American disjunct distribution (e.g., Satake 1982, Ji and Duyfjes 2000, Ji 2002, Qiu et al. 2008). The three species are two Japanese species, *C. heterosepala* (Baker) Okuyama and *C. japonica* Miq. [= *C. kiusiana* Makino], and a North American species, *C. pauciflora* Torr. ex Torr. & A. Gray. Recently *C. japonica* is also reported from Continental China (Institute of Botany, Academia Sinica 1976, Ji and Duyfjes 2000, Ji 2002, Li et al. 2008).

Both Asian species, *C. heterosepala* and *C.*

japonica, are known from Kyushu, southern Japan. In May 2008 one of the authors (M.S.) encountered curious *Croomia* plants in the northern part of Miyazaki Prefecture, central Kyushu. The plants were attributed to neither *C. heterosepala* nor *C. japonica*. Following this botanical survey was conducted in Miyazaki Prefecture and its adjacent region. Consequently it has turned out that two new species of *Croomia* are distributed in Miyazaki Prefecture. This paper describes the two new species.

1. *Croomia saitoana* Kadota, sp. nov.

[Figs. 1–2, 5B, 8B]

Affinis *Croomiae japonicae*, sed floribus



Fig. 1. Type specimen of *Croomia saitoana* Kadota.



Fig. 2. Habit of *Croomia saitoana* Kadota. At Tanohara, Hyūga, Miyazaki Pref., Kyushu, Japan, on 20 April 2010.

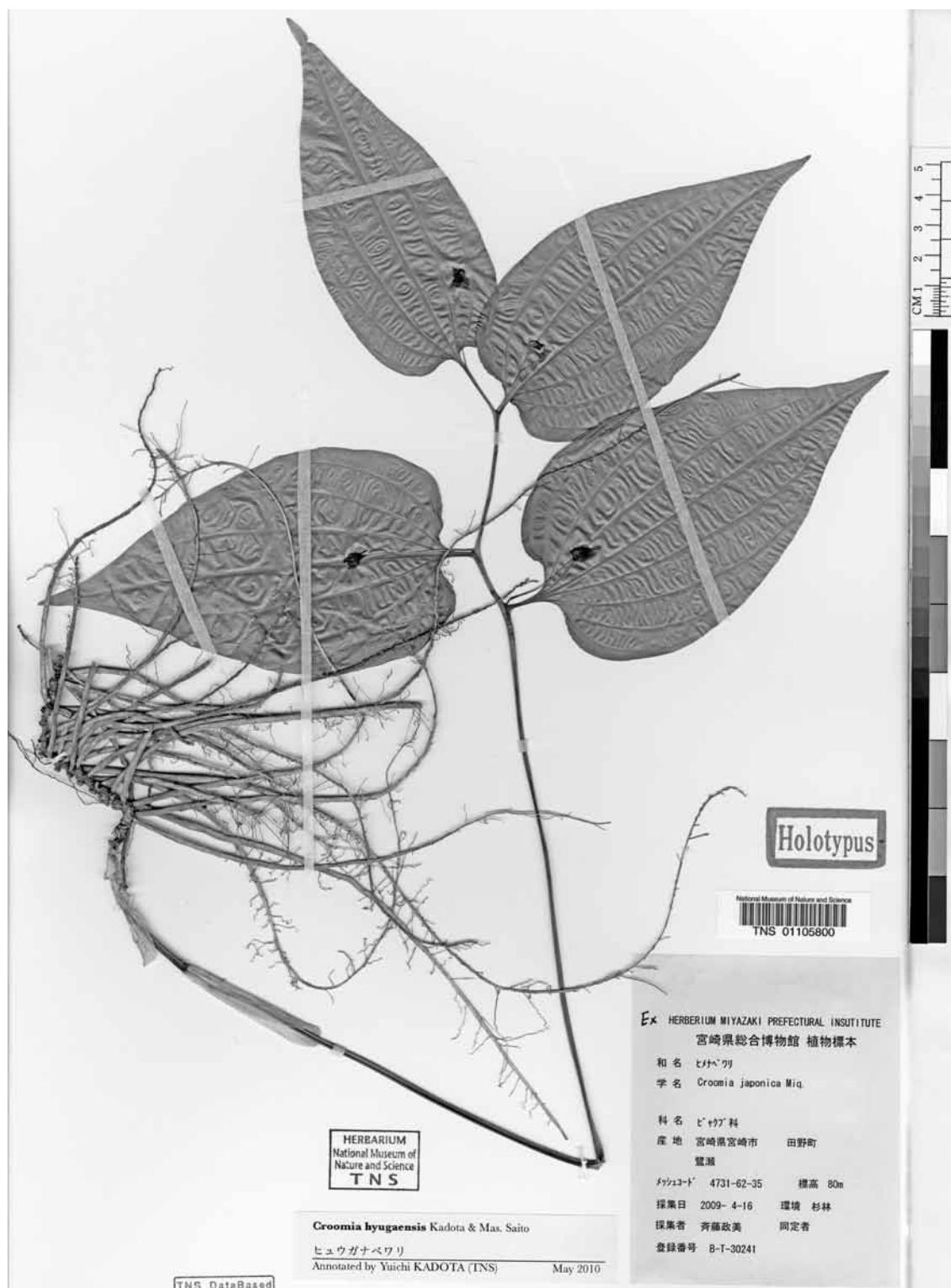


Fig. 3. Type specimen of *Croomia hyugaensis* Kadota & Mas. Saito.

minoribus solitariis atropurpureobrunneis, filamentis staminum crassioribus brevioribus, caulibus crassioribus purpureis, bracteis minutis 0.5–1 mm longis, foliis caulinis (6–)7–11 venis 5–9 differt.

TYPE: JAPAN. Kyushu, Miyazaki Pref., Hyūga-shi, Tanohara, 16 April 2010, M. Saito s.n. (TNS 01105807–holotype, Fig. 1; KYO, MBK, TI, TNS 01105806, 01105808–isotype).

A herbaceous perennial, 45–60 cm tall. Rhizome subterranean, horizontal, up to 10 cm long, necklace-shaped; internodes 2–3 mm long; roots thread-like, carnose, ca. 2 mm in diameter, fasciculate. Stem suberect, glabrous, simple, shallowly fulcate. Basal leaves yellowish white, ca. 1 cm long, ovato-oblong, membranous, scaly. Lower caudine leaves light yellowish green, membranous, scaly, vaginate. Upper caudine leaves 6–9, situated in the upper part of the stem, alternate; blades membranous but thickened along the margin, light green above, glaucous and lustrous beneath, ovato-oblong, 5.5–16 cm long, 2.5–8 cm wide, 5–9-veined, acute at apex, cuneate to truncate to shallowly cordate at base; petioles 1.5–3 cm long, glabrous, amplexicaul, slightly auriculate, decurrent. Flowers April to May, 4–5 mm in diameter, axillary, solitary or rarely 2 in a loose cyme, bracteate; peduncels 3–5 cm long, glabrous, articulate, thickened at base; bracts minute, 0.5–1 mm long, lanceolate. Perianth-segments 4, cruciate, subequal, dark brownish purple, or yellowish green in the upper half and brownish purple in the lower half, triangular-ovate, 3 mm long, 2 mm wide, more or less reflexed, with strongly reflexed margins, papillate, persistent during the fruiting time. Stamens 4; filaments dark brownish purple, cylindrical, 1–1.5 mm long, 1 mm in diameter, papillate; anthers widely oblong, basifix. Styles minute.

Japanese name: Kobana-nabewari (nov.).

新和名：コバナベワリ

Distribution: Northern part of Miyazaki Pref., Kyushu (Fig. 6, triangle). Endemic to Japan.

Additional specimens examined: JAPAN. Kyushu.

Miyazaki Pref., Nobeoka-shi, Maino-cho, 5 May 2008, fl., M. Saito s.n. (TNS 772873–772874); Maino-cho, in bamboo woods, alt. 30 m, 4 May 2008, fl., M. Saito B-T-29946 (TNS 1105812); Maino-cho, in bamboo woods, 16 Apr. 2010, fl., M. Saito s.n. (TNS 1105809–1105811). Hyūga-shi, Tanohara, Nagasaki, 4 May 2008, fl., M. Saito s.n. (TNS 772876–772877); Tanohara, in evergreen broad-leaved woods, alt. 90 m, 4 May 2008, fl., M. Saito B-T-29948 (TNS 1105813).

Croomia saitoana is different from *C. japonica* Miq. (Fig. 7, left)[= *C. kiusiana* Makino (Fig. 7, right)] by having small (Fig. 5A, B), solitary, dark purplish brown flowers, thicker and shorter staminal filaments, thicker purplish stem, the absence of bracts and (6–)7–11 caudine leaves with 3–5 veins.

Croomia saitoana grows under warm-temperate, laurel forests and *Cryptomeria japonica* plantations.

2. *Croomia hyugaensis* Kadota & Mas. Saito, sp. nov. [Figs. 3–4, 5D, 8C]

Differt a *Croomia japonica* floribus solitariis, foliis caulinis 4–6, ovato-oblongis basi cordatis margine integris; a *C. saitoana* floribus majoribus, filamentis staminis longioribus, caule gracili viridi, bracteis prominentibus linearibus vel spathulatis, foliis caulinis 4–6, leviter carnosis, ovato-oblongis basi truncatis vel subcordatis, venis 5–7.

TYPE: JAPAN. Kyushu, Miyazaki Pref., Miyazaki-shi, Tano-cho, Sagise, alt. 80 m, 16 April 2009, M. Saito B-T-30241 (TNS 01105800–holotype; Fig. 3).

A herbaceous perennial, 30–45 cm tall. Rhizome subterranean, horizontal, up to 10 cm long, necklace-shaped; internodes ca. 5 mm long; roots thread-like, carnose, 2–2.5 mm in diameter, fasciculate. Stem suberect, glabrous, simple, fulcate. Basal leaves yellowish white, ca. 1 cm long, ovato-oblong, membranous, scaly. Lower caudine leaves light yellowish green, membranous, scaly, vaginate. Upper caudine leaves 4–6, situated in the upper part of the stem, alternate; blades somewhat fleshy, light green above, glaucous and lustrous beneath, ovato-



Fig. 4. Habit of *Croomia hyugaensis* Kadota & Mas. Saito. At Nekozaka, Kobayashi, Miyazaki Pref., Kyushu, Japan, on 22 April 2009.

oblong, 9–13 cm long, 4–8 cm wide, 5–7-veined, acute at apex, truncate to shallowly cordate at base; petioles 0.5–2 cm long, glabrous, not amplexicaul, not auriculate, decurrent. Flowers April to May, 7–10 mm in diameter, axillary, solitary, bracteate; peduncels 3–5.5 cm long, glabrous, articulate, thickened at base; bracts prominent, 1–5 mm long, linear to spatulate. Perianth-segments 4, cruciate, subequal, yellowish green in the upper half and brownish purple in the lower half, triangular-ovate, 5 mm long, 2–3 mm wide, more or less reflexed, with strongly reflexed margins, papillate, persistent during the fruiting time. Stamens 4; filaments dark brownish purple, cylindrical, 3–4 mm long, 1–1.5 mm in diameter, papillate; anthers widely oblong, basifix. Styles minute.

Japanese name: Hyûga-nabewari (nov.).

新和名: ヒュウガナベワリ

Distribution: Southern part of Miyazaki Pref., Kyushu (Fig. 6, star). Endemic to Japan.

Additional specimens examined: JAPAN. Kyushu. Miyazaki Pref., Kita-Morokata-gun, Yamanokuchi-cho (currently Miyakonojô-shi), Higashidake National Forest, 14 May 1952, y. fr., M. Nagasawa s.n. (TNS 102642, 116506–116507, 132585). Minami-Naka-gun, Kitagô-cho (currently Nichina-shi), Yamadake, Kuen-dani, 3 May 1953, fl. & y. fr., D. Shimizu 19 (TNS 113761). Kobayashi-shi, Nekozaka, under evergreen broad-leaved woods, alt. 320 m, 22 Apr. 2009, M. Saito B-T-30242 (TNS 1105799).

Croomia hyugaensis is distinguished from *C. japonica* by having solitary flower with wider perianth-segments (Fig. 5C, D), entire leaf margin (Fig. 8A, C), 4–6, slightly fleshy, cordate caulin leaves with cordate base; from *C. saitoana* by larger flowers (Fig. 5A, B),

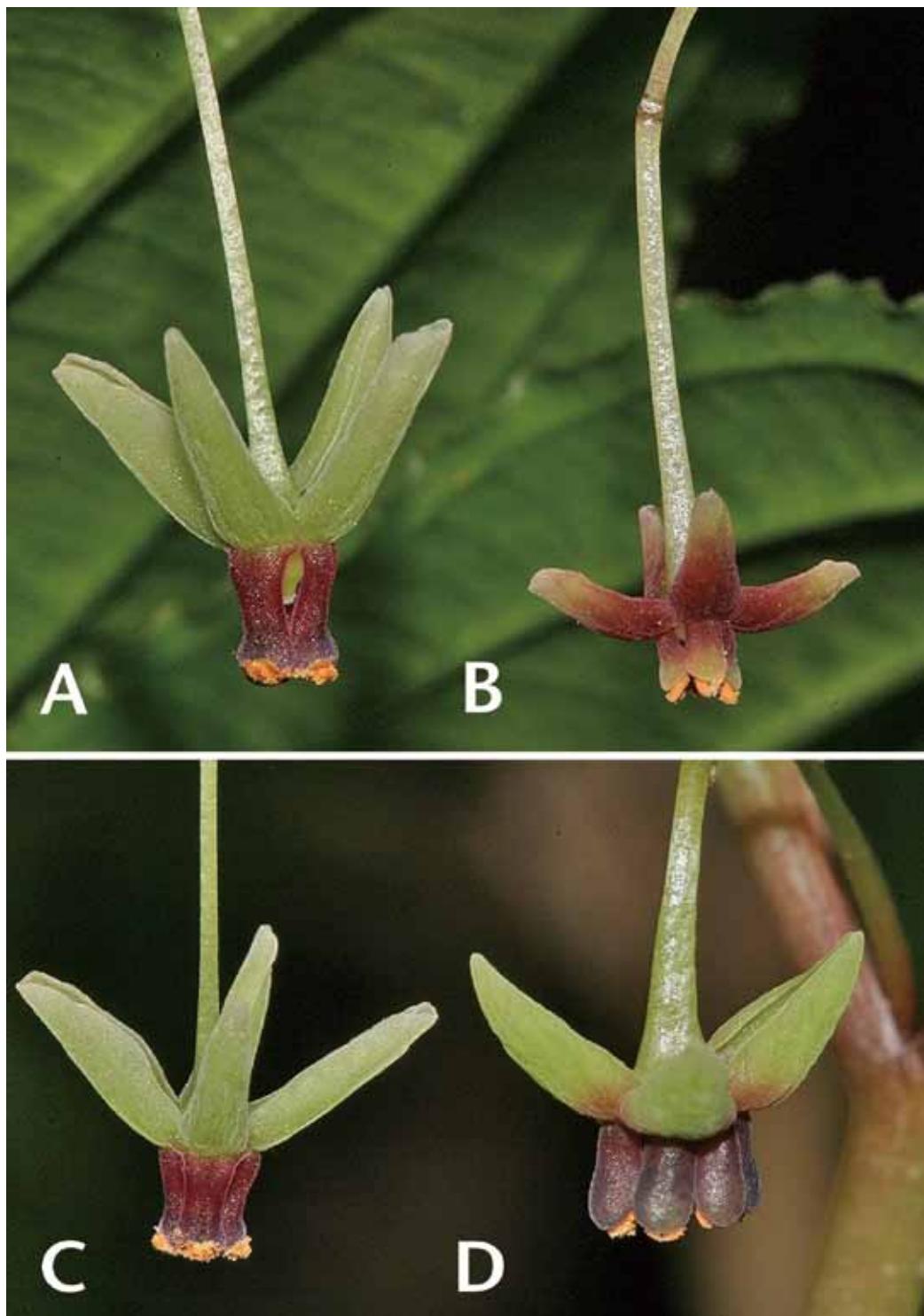


Fig. 5. Comparison of flowers among *Croomia* species. A, C. *C. japonica*. Nobeoka, Miyazaki Pref. (cult. at Miyazaki, Miyazaki Pref.). B. *C. saitoana*. Tanohora, Hyūga, Miyazaki Pref. D. *C. hyugaensis*. Nekozaka, Kobayashi, Miyazaki Pref.

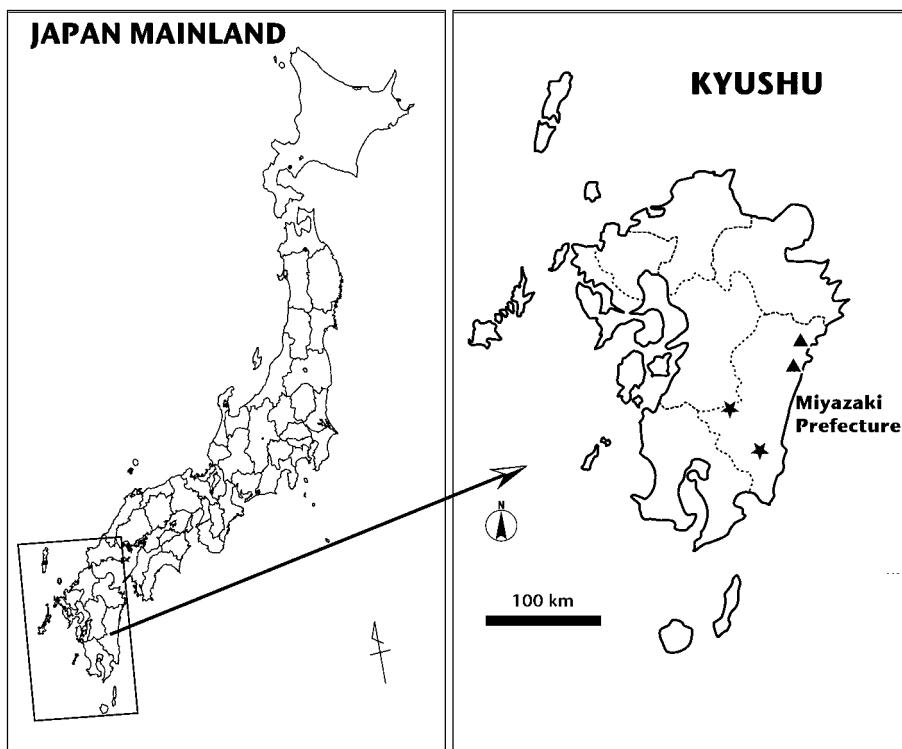


Fig. 6. Distribution of *Croomia saitoana* Kadota (triangle) and *C. hyugaensis* Kadota & Mas. Saito (star).

longer staminal filaments, slender green stem, prominent, linear to spatulate bracts and 4–6, slightly fleshy, cordate caudine leaves with 5–7 veins and with entire margin (Fig. 8, B, C).

Figure 8 shows leaf margin of *Croomia japonica*, *C. hyugaensis* and *C. saitoana*. Both in *C. japonica* and *C. saitoana* leaf margin is serrulate while *C. hyugaensis* has an entire leaf margin.

Croomia hyugaensis grows under warm-temperate, laurel forests.

Key to the species of *Croomia*

- A. Perianth-segments heteromorphic, orbicular to broadly elliptic, slightly incurved along margin; leaves not lustrous ... *C. heterosepala*
- A. Perianth-segments monomorphic, narrowly triangular ovate, more or less recurved along margin; leaves lustrous
- B. Flowers yellowish green, 2–4 in a cyme or rarely solitary, if cymose, peduncle non-
 - articulate; bracts lanceolate, 2–3 mm long
 - C. Leaves cuneate to shallowly cordate at base; cymes longer than the petioles; internodes of rhizome less than 1 cm
 - *C. japonica*
 - C. Leaves cordate at base; cymes shorter than or equal to the petioles in length; internodes of rhizome 2–6 cm
 - *C. pauciflora*
 - B. Flowers dark purplish brown at least in the lower half, solitary, peduncle articulate; bracts less than 1.5 mm long or absent
 - D. Flower small, 4–5 mm across, dark purplish brown; Perianth-segments shorter than 2 mm, subequal; filaments thick and short, 1–1.5 mm long; bracts usually absent, if present, 0.5 mm long; caudine leaves 7–11, membranous, narrowly ovato-oblong, with 3–5 veins
 - *C. saitoana*
 - D. Flower large, ca. 1 cm across yellowish

Table 1. Comparison of morphological traits among *Croomia hyugaensis*, *C. japonica* and *C. saitoana*

| | <i>C. hyugaensis</i> | <i>C. japonica</i> | <i>C. saitoana</i> |
|-------------------|---|---|---|
| Flower | solitary, large, 1 cm across, yellowish green, sometimes light brownish purple only at base | (1–)2–4 in cyme, large, 1 cm across, yellowish green | solitary, small, 4–5 mm across, dark purplish brown at least below the middle |
| Staminal filament | thick and long (3–4 mm long and 1–1.5 mm across) | thin and long (4 mm long and 0.5–0.8 mm across) | thick and short (1.5 mm long and 1 mm across) |
| Leaf margin | entire and non-margaritaceous | serrulate and margaritaceous | serrulate and non-margaritaceous |
| Stem | slender, green or light reddish purple | slender, green | thick, purplish |
| Leaf base | slightly amplexicaul, not auriculate, decurrent but not winged on stem | amplexicaul, not auriculate, decurrent and winged on stem | amplexicaul, auriculate, decurrent and shortly winged on stem |
| Bract | linear to spatulate, 1–5 mm long | lanceolate, 1–3 mm long | absent or very small, if present, linear, 1–2 mm long |
| Cauline leaf | 4–6, cordate to narrowly cordate | 6–7, ovate to narrowly ovate or ovato-elliptic | (6–)7–11, narrowly ovato-oblong |
| Leaf vein | 5–7 | 5–9 | 3–5 |
| Leaf base | cordate | shallowly cordate to truncate | cuneate to cordate or shallowly cordate |
| Petiole | light reddish purple | purplish | green |
| Leaf blade | somewhat fleshy | membranous | membranous |

green or dark purplish brown only in the lower half; Perianth-segments longer than 6 mm, inner slightly shorter than the outer; filaments 3–4 mm long; bracts linear to spatulate, 1–5 mm long; cauline leaves 4–6, slightly fleshy, cordate to narrowly cordate, with 5–7 veins *C. hyugaensis*

Croomia japonica from China

Croomia japonica has been reported from Continental China (Institute of Botany, Academia Sinica 1976, Ji and Duyfjes 2000, Ji 2002), however, we had no opportunities to examine Chinese material. According to the descriptions and the illustration (Institute of Botany, Academia Sinica 1976, t. 7673) there are some significant differences between Chinese and Japanese plants: in Chinese plants the flowers are smaller, the perianth-segments are triangular ovate and smaller, and the caudine

leaves 3–5 and ovate in outline. Consequently the Chinese materials should not be ascribed to *C. japonica*. The molecular data of Li et al. (2008) also suggested that Chinese populations were genetically segregated from the Japanese populations. The Chinese plants are supposed to belong to an undescribed taxon in the genus *Croomia*, which is akin to *C. japonica* Miq.

We wish to show our cordial thanks to Dr. S. Akiyama, Department of Botany, National Museum of Nature and Science, for taking pictures of the type materials of *Croomia japonica* Miq. at L, to Dr. H. Kato, Makino Herbarium, Tokyo Metropolitan University, for taking and sending pictures of the holotype specimen of *C. kiusiana* Makino at MAK and to Dr. A. Shimizu, The University Museum, The University of Tokyo, to Dr. N. Tanaka, Department of Botany, Kochi Prefectural



Fig. 7. Left. Lectotype specimen of *Croomia japonica* Miq. (L 0422345). Left corner inset shows flower. Courtesy of Dr. S. Akiyama. Right. Holotype specimen of *Croomia kiusiana* Makino (MAK 207635). Courtesy of Dr. H. Kato.

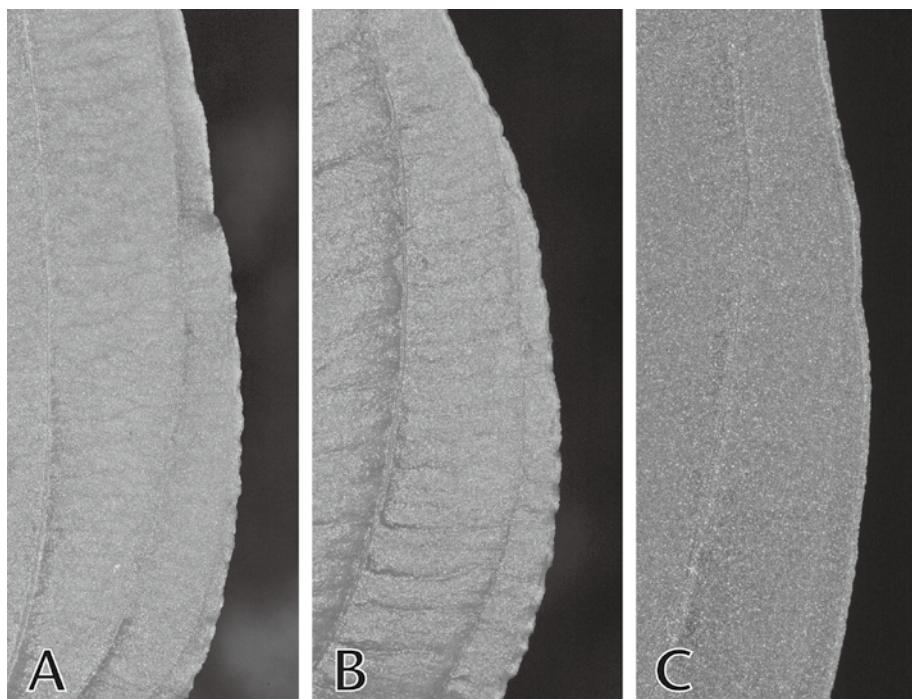


Fig. 8. Comparison of leaf margin in *Croomia japonica* (A), *C. saitoana* (B) and *C. hyugaensis* (C).

Makino Botanical Garden, for checking Dr. Tomitaro Makino's *Croomia* collections in TI and MKB, and to Dr. H. Nagamasu, The Kyoto University Museum, Kyoto University, for correcting Latin descriptions, respectively.

Literature cited

Institute of Botany, Academia Sinica 1976. *Croomia*. *Iconographia Cormophytorum Sinicorum* **5**: 422, t. 7673. Science Press, Beijing (in Chinese).

Ji Zhan-He 2002. *Croomia*. In: Fu Li-Kuo and Hong Tao (eds.), *Higher Plants of China* **13**: 313, t. 505 (same as t. 7673 of *Iconographia Cormophytorum Sinicorum* vol. 5). Qindao Publishing House, Qindao (in Chinese).

Ji Zhan-He and Duyfjes B. E. E. 2000. *Croomia*. In: Wu Zheng-Yi and Raven P. H. (eds.), *Flora of China* **24**: 72. Science Press, Beijing and Missouri Botanical Garden, St. Louis.

Li En-Xiang, Yi Sun, Qiu Ying-Xiong, Guo Jiang-Tao, Comes H. P. and Fu Cheng-Xin 2008. Phylogeography of two East Asian species in *Croomia* (Stemonaceae) inferred from Chloroplast DNA and ISSR fingerprinting variation. *Mol. Phylogen. Evol.* **49**: 702–714.

Satake Y. 1982. *Croomia*. In: Satake Y., Ohwi J., Kitamura S., Watari S. and Tominari T. (eds.), *Wild Flowers of Japan, Herbaceous Plants (including Dwarf Subshrubs)* I: 52. Heibonsha Lyd., Tokyo (in Japanese).

Whetstone R. D. 2002. *Croomia*. In: Flora of North America Editorial Committee (ed.), *Flora of North America North of Mexico* **26**: 466–467. Oxford University Press, New York.

Wu Kuo-Fang, Ma Wei-Liang, Hong De-Yuan and Ji Zhan-He 1997. *Croomia*. In: Wu Kuo-Fang (ed.), *Fl. Reipubl. Popul. Sin.* **13**(3): 259–260. Science Press, Beijing (in Chinese).

門田裕一^{a*}, 齊藤政美^b: 宮崎県産ナベワリ属 (ビャクブ科) の2新種

宮崎県からナベワリ属 (ビャクブ科) の2新種, コバナベワリ *Croomia saitoana* Kadota とヒュウガナベワリ *C. hyugaensis* Kadota & Mas. Saito を記載した。コバナベワリはヒメナベワリ *C. japonica* Miq. (= *C. kiusiana* Makino) とは, ①花は小さく, 单生し, 紫褐色を帶び, ②花糸がより太くかつ短く, ③茎が太くて紫色を帶び, ④苞を欠き, ⑤茎葉は普通7-11枚で, 脈が3-5本である点で区別される。ヒュウガナベワリは①花が单生し, ②葉縁が全縁的で, ③茎葉は4-6枚あり, やや肉質, 心形で, 基部も心形であることからヒメナベ

ワリと区別され, ⑤花が大きく, ⑥花糸が長く, ⑦茎が細くかつ緑色で, ⑧苞が顯著で, 線形ないし匙形であり, ⑨茎葉は4-6枚あり, やや肉質, 心形で, 基部も心形であり, 脈が5-7本ある点でコバナベワリと区別できる。

コバナベワリとヒュウガナベワリはナベワリ属ではそれぞれ4番目と5番目の種であり, いずれもこれまでに宮崎県のみに知られている。

(^a国立科学博物館 植物研究部,

^b宮崎県総合博物館)